S. Okamoto et al.
U.S. Serial No. 09/835,194
Page 11 of 15

REMARKS

Claims 1, 3-9, 13, 15, 21, 22, 24-26, 28, 30, 34, 41, 42, 44-46, 48, and 50 are pending in the application. Claims 1, 6, 13, 21, 22, 28, 34, 41, 42, and 48 (including independent claims 1, 22, and 42) have been amended by the present amendment. The amendments are fully supported by the specification as originally filed (see, e.g., page 28, last paragraph to page 29, first paragraph; page 31, line 1 to page 35, line 16; and page 80, last paragraph to page 81, first paragraph).

As amended, claim 1 recites an image reproducing method includes a step of reproducing an image so that an exponential value of an exponential function approximately representing the input signal-output brightness property increases with an increase of the average signal level, where the image is reproduced by obtaining the maximum output brightness of a pixel from the average signal level, performing compensation of the picture signal in accordance with the input signal-output brightness property, and feeding the display apparatus with the picture signal subject to compensation.

Independent claims 22 and 42 have been amended to recite that the image display apparatus and the picture signal compensation device include an average signal level operation section, an input signal-output brightness property setting section, a maximum output brightness adjustment section, a signal compensation section including a first signal compensation section and a second signal compensation section, and a signal conversion section "for converting a picture signal subject to compensation in the signal compensation section based on an operational result of the maximum output brightness, so as to output the picture signal subject to conversion to the display apparatus."

With reference to FIG. 1 of the application, picture signal compensation device 7 includes an average signal level operation section 1 for performing an operation on an average level of all the pixel signals as an average input brightness signal level G, an input signal-output brightness property setting section 2 for setting an input signal-output brightness property

representing variations in brightness of a pixel with respect to a level of a pixel signal in accordance with the average input brightness signal level G, a maximum output brightness adjustment section 3 for adjusting maximum output brightness of a pixel in display apparatus 8 in accordance with the average input brightness signal level G, and a signal compensation section 4 for compensating a picture signal g_0 so as to satisfy the input signal-output brightness property which was set.

Referring to claims 22 and 42, the signal compensation section 4 is made up of a $\gamma(G)$ compensation circuit ("first signal compensation section") 5 for compensating the picture signal g_0 according to an I/O property which is the same as the set input signal-output brightness property, and an inverse property compensation circuit ("second signal compensation section") 6 for further compensating a picture signal g_1 according to an I/O property which is the opposite of the I/O property (input signal-output brightness property) of the display apparatus 8. Further, in the signal compensation section 4, an input picture signal (picture signal g_0) is compensated so that an exponential value (gamma value) in which the input signal-output brightness property of the image display apparatus is approximately represented by an exponential function coincides with a setting value $\gamma(G)$, and the picture signal g_0 is output to the display apparatus 8. Moreover, in the maximum brightness adjustment circuit 3, maximum output brightness of a pixel of the display apparatus is adjusted in accordance with the average input brightness signal level G. *See* specification at page 31, line 1 to page 35, line 16.

Applicants' claimed invention can provide significant benefits. As illustrated by equation (5) in the specification, $I(g,G) = i_{max}(G) * g^{\gamma(G)}$, when setting the maximum output brightness $I_{max}(G)$ and the gamma value $\gamma(G)$ in accordance with the average input brightness signal G of the picture signal subject to inverse gamma compensation, it is possible to perform display with high definition, regardless of the type of display apparatus (see specification at page 28, last paragraph to page 29, first paragraph; see also page 35, second full paragraph).

Claims 22 and 42 also recite a signal conversion section. The display apparatus preferably can utilize an emission-type optical switching element, where the maximum output

S. Okamoto et al.
U.S. Serial No. 09/835,194
Page 13 of 15

brightness adjustment section can adjust the maximum output brightness, and the display apparatus further includes a signal conversion section for converting the picture signal subject to compensation in the signal compensation section based on an operational result of the maximum output brightness, so as to output the picture signal to the optical switching element (see claims 22 and 42). *See also* specification at page 80, last paragraph to page 81, line 21.

Claims 1-6, 9, 11, 12, 14, 15, 57-59 and 61 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent 5,546,134 to Lee in view of Japanese Publication 06-006820 to "Tadashi" and U.S. Patent 6,608,610 to Nagai. Claims 16, 18, 38, and 40 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent 6,278,436 to Hosoi et al. (hereinafter "Hosoi") in view of Nagai. Claims 8, 22-28, 30-33, 35-37, 42-48, 50-56, and 60 were rejected under 35 USC §103(a) as being unpatentable over Lee, Tadashi, and Nagai in view of U.S. Patent 6,289,162 to Uehara et al. The remaining dependent claims also were rejected on combinations of prior art references. These rejections are respectfully traversed.

As explained in previous responses, the Lee and Tadashi references cannot be combined to somehow produce the Applicants' claimed invention. In the present Office Action, Nagai was combined with Lee and Tadashi.

Nagai discloses a plasma display device in which peak luminance is lowered at high image display ratios in a plasma display panel (PDP) (see, e.g., column 16, lines 20-23), which is intended to solve unique problems in PDPs such as preventing burnt-in high luminance images on a PC monitor and reducing power consumption (see column 6, lines 41-44). To achieve a predetermined luminance level, the PDP emits multiple beams of binary luminance levels of discharge in a single frame. In short, the eye perceives the number of binary pulse emissions in a single frame as luminance level. Due to its structure, the PDP consumes power in proportion to the number of pulse emissions. For these reasons, the peak luminance level is lowered at high image display ratios in Nagai.

S. Okamoto et al.
U.S. Serial No. 09/835,194
Page 14 of 15

In contrast, the Applicants' claimed invention addresses, for example, unique display issues that apply to liquid crystal displays, such as the voltage-transmittance property of liquid crystals and the appearance of blunt images, and compatibility issues of signal control sections of different types of displays, for example: the emission element (backlight) is controlled based on average picture level (APL) so that the maximum luminance is low at high APL and high at low APL, the exponential value of the exponential function approximately representing the input signal-output brightness property is increased with an increase in APL by the picture signal control section, and two converter sections, i.e., **first and second signal compensation sections** are provided for processing signals by the input signal-output brightness property based on the exponential value, so as to match the display characteristics of different types of display apparatus.

The combination of Lee in view of Tadashi and Nagai does not teach or suggest an image reproducing method in which an exponential value of an exponential function approximately representing the input signal-output brightness property increases with an increase of average signal level, and where the image is reproduced by performing compensation of the picture signal subject to compensation in accordance with the input signal-output brightness property thus set based on maximum output brightness, as recited in claim 1.

Referring to claims 22 and 42, the combination of Lee in view of Tadashi and Nagai does not teach or suggest an image display apparatus or a picture signal compensation device including a signal conversion section and a signal compensation section including **first and second signal compensation sections**, as described above.

It is believed that the claims are now in condition for allowance. However, if there are any outstanding issues, the Examiner is urged to call the Applicants' representative at the telephone number listed below.
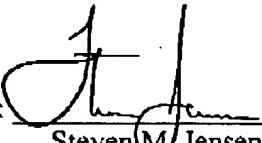
S. Okamoto et al.
U.S. Serial No. 09/835,194
Page 15 of 15

Applicants believe that additional fees are not required for consideration of the within response. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, the Commissioner is hereby authorized and requested to charge Deposit Account No. 04-1105.

Respectfully submitted,

EDWARDS & ANGELL, LLP

Date: July 12, 2005   By: _____
                                         Steven M. Jensen
                                         (Reg. No. 42,693)

                                         P.O. Box 55874
                                         Boston, MA 02205

Phone: (617) 439-4444

Customer No. 21874